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ABSTRACT

This study aims to find strategies and methods of handling degradation of mangroves and coastal erosion in Brebes Regency. The research was conducted during the four months, June-September 2012. The results showed that community in particular mangrove *Rhizophora* sp and followed by *Avicenia* dominated mangrove ecosystem at some point on the coast along the Brebes Regency. Brebes coastal erosion occurs at different levels. Efforts to reduce coastal erosion has been done both by the public and relevant agencies through the planting of mangroves on the coast, embankment ponds, waterways and farms with breakwaters.

Weighted level of public perception in the management of mangrove / coastal erosion in Brebes 92.53% (excellent), while 77.07% participation (good). Perception of the value of the correlation coefficient 0.0852 participation and closeness relation is very small, only 0.73% (do not affect each other). Ecological physical factors (X1) and socio-cultural factors (X2) jointly influence the occurrence of damage to mangroves and coastal erosion (Y), but tend to be more dominant ecological factors followed the pattern of Y = 5.042 + 0.446 X1 - 0.008 X2. SWOT analysis results show the value of total internal strategic factors 2.30 and 2.15 are in a position external segment 5 (mangrove area is relatively stable condition and possible can be developed). Analysis of the results hierarchy process (AHP) shows that the order of priority strategies / methods of managing mangrove / coastal erosion in Brebes Regency are: 1) improving protection mangrove / shore of sea waves / abrasion and develop through retention / breakwater is more effective, 2) increase empowering potential of mangrove areas through productive activities that increase the added value for improving the welfare of local communities while preserving the mangrove / coastal resources; 3) effective implementation of regulations and optimize the role of relevant institutions, civil society organizations, and the participation of local communities in conserving the mangrove areas and existing coastal resources and develop; 4) strengthen the institutional system, both government and public institutions in the management of mangrove areas for short, medium and long, and 5) increase outreach activities / community, including youth empowerment related to the importance of the existence of mangrove conservation coastal resources.

Keywords: ***mangrove degradation; abrasion; methods and strategies***

I. INTRODUCTION

1.1 Background

Mangrove is a general term used to describe varieties of tropical beach community that is dominated by a few species of trees and shrubs that typically have the ability to grow in the salty waters. Brebes coastal area of Central Java Province along 65.480 kms, partly overgrown with mangrove beaches. Extensive mangrove in Brebes Regency in 2000 was 505 hectares where 210 hectares are in good condition, 205 hectares in moderate condition and 90 hectares in a damaged condition (Departement of Forestry and Plantation Brebes Regency,

2000). Ironically in 2008, precisely the extent of mangroves in coastal areas Brebes stay at 257.11 hectares (60%), scattered from Losari Sub District 25.43 hectares, Tanjung Sub District 18.95 hectares, Bulakamba Sub District 39.55 hectares, Wanasari Sub District 27, 29 hectares, and Brebes Sub District 145.89 hectares (Department of Fisheries and Marine Brebes Regency, 2008). Until 2000, covering coastal erosion Brebes accretion area of 789 hectares, while 310 hectares. From 2000 to 2008 abrasion in Brebes Regency reached 640.45 hectares with a shoreline length of 27.043 kms and accretion occurring 815.76 hectares covering the 27.147 kms long coastline.

1.2 Problem Formulation

1. How the influence of ecological processes on mangrove damage and erosion in coastal areas Brebes?
2. The extent to which perceptions, aspirations and community participation as well as the effectiveness of existing policies against abrasion and damage mangroves in coastal areas Brebes?
3. How the methods and strategies of effective implementation in handling mangrove destruction and coastal erosion in Brebes ?

1.3 Research Objectives

1. Analyzing the relationship between the patterns and ecological processes in the occurrence of mangrove destruction and coastal erosion in the Brebes area.
2. Explain possible correlations between perceptions, aspirations and community participation as well as the effectiveness of existing policies on mangrove damage and abrasion as well as handling in Brebes coastal areas.
3. Find method with an effective implementation strategy for dealing damage to mangroves and coastal erosion in Brebes.

1.4 Benefits of Research

1. This research is academically expected to benefit in developing a method of treating damaged mangrove and coastal erosion-based co-management in coastal areas Brebes.
2. This study is expected to yield some practical recommendations on strategy implementation methods of handling and abrasion damage to mangrove-based co-management in coastal areas Brebes.

1.5 Research Methods

This is a descriptive study using data-quantitative field observations as a comparison of satellite data, and secondary data from relevant parties. Processing of the data used in the form of a simple regression analysis to determine the perception of the relationship with community participation. Multiple regression analysis, ANOVA, t test and R^2 test is used to determine the level of influence of ecological factors and socio-cultural level of the mangrove ecosystem damage / abrasion. Determination method of treating damaged mangrove-strategy / coastal erosion in the Regency of Brebes using SWOT analysis and analytical hierarchy process (AHP).

1.6 Place and Time Research

The research was conducted in Brebes Regency, Central Java for 4 months in June to October 2012

II. RESULTS AND DISCUSSION

2.1 Field Observations

Field observations made on May 23, 14 June and 2 September 2012 to perform along the in shore areas Randusanga, Kaliwlingi, Sawojajar, Krakahan and Karang Dempel objects near to the beaches and waters of observation conditions, estuaries, and mangrove vegetation / other there. Data aspirations and perceptions in the study site taken in the event Focus Group Discussion (FGD) were held on June 4, 2012 in the village hall Randusanga Kulon, Sub District of Brebes, attended by officials of the Department of Marine and Fisheries Brebes Regency, the village chief and staff Randusanga Wetan, Randusanga Kulon, Kaliwlingi and Sawojajar, community leaders / NGOs, and community livelihood of farmers and fishermen / shrimp / crab, actors reforestation / planting 1 mangroves and mangrove task force representatives. Search people's aspirations for the Sub District of Tanjung and Sub District of Losari held on 2 September 2012 at Krakahan and Karangdempel to through interviews and questionnaires involving village heads, community leaders and representatives of local NGOs.

1.Mangrove

Mangrove community, particularly from true mangrove species, especially mangroves (*Rhizophora mucronata*) followed by fires (*Avicenia* sp.) are found in coastal areas Brebes. Of observations in the field, mangroves are seen on either side of the mouth of the river, in the embankments and ponds in coastal waters either in the form of old mangrove areas and newly planted 4 months old s / d 2 year 2 Mangrove is a general term used to describe varieties of tropical beach community that is dominated by a few species of trees and shrubs that typically have the ability to grow in the salty waters. Of this 2 vegetation community generally grows in the intertidal and supratidal (tidal) are getting enough water flow and sheltered from large waves and tidal currents are strong (Sha'rani and Suryanto, 2006).

The emergence of the phenomenon or zoning on mangrove ecosystems related to several factors such as soil type, the openness of the pounding waves mangrove areas, salinity and tidal influence. In general, adaptation to a low oxygen content have made a mangrove tree root system is typical, for example by having a chicken claw type pneumatofora to take oxygen from free air (found in *Avicennia*, and *Sonneratia xylocarpus*), and the type of buffer / wand that has a lenticell (found on *Rhizophora*). Adaptation to the environment with high salt content circum vented by mangrove trees by having specialized cells in the leaves that serves to store salt; has leaves which are much thicker and stronger to regulate the balance of salt water, and leaves have stomata with a special structure for reduce evaporation. While the adaptation of the soil is less stable due to the tidal done by developing a very extensive root structure and form a horizontal network wide. In addition to strengthening the tree, the roots also serve to take nutrients and hold sediments (Bengen, 2001).

2. Function of Mangrove Forests

In ecological terms, as a typical coastal ecosystems with calm waters, mangrove forests have important ecological functions, namely (Sha'rani and Suryanto, 2006):

1. As against waves and wind storms, coastal protection from abrasion, mudguard and trap sediments transported by surface run off and to control seawater intrusion.
2. As a producer of large amounts of detritus, mainly derived from the leaves and branches of mangrove trees are deciduous. Most detritus is used as food for detritus

eaters, and some described a bacterial nutrient minerals that play a role in the enrichment of waters.

3. As the breeding (nursery ground), local foraging (feeding ground) and spawning areas (spawning ground) for a variety of aquatic biota such as fish, shrimp, and mollusca both living in shore and offshore.
4. Mangrove is a habitat for many species of birds and a variety of organisms that live around it. This area is considered by many researchers as an ecosystem with high productivity but very vulnerable (Tuwo, 2011).

3. Utilization of the Economic Activity.

Economically, the mangrove forest is a natural resource which is used as a potential ecotourism area. Forms and unique characteristics of mangrove trees is capital to tourist destination with a familiar theme of the natural ecosystem of mangrove forest, mangrove species and breeding way while crossing the roots using a boat. On the other hand, some economic activities can potentially be a threat to mangrove ecosystems such as mangrove encroachment into the area of farms, orchards and residential areas / inn. On the beach they found the Brebes Regency felling of mangrove trees as a material for building houses and firewood.

4. Characteristics of Coastal

a. Sandy beach
   Sandy beaches along the coast are found almost in Brebes which is characterized by sand beaches as coastal boundary. Sized fine sand, brown color, wide beach sand stone varies from 5-50 meters and slope (beach slope) of about 4 º - 14 º. While the dominant slope rather steep beach look that the beach is in the process of abrasion.
b. Coastal vegetated
   Randusanga coastal vegetation, Kaliwlingi, Sawojajar, Krakahan and Karangdempel to consist of a variety of specific plant species both coastal and terrestrial (land). Specific plant species that are often found on the beach shore Randusanga include hibiscus and casuarina. Mangrove communities are often found along the coast Randusanga to several points along the coast near to Karangdempel.
c. Abraded beach
   Brebes found along the coast several beaches are experiencing erosion point either relatively new or long enough. This makes the reduction in the area of abrasion or loss of beach area / plot aquaculture farms so that activities can not be carried out in their again. Some farmers try to work around this by creating a bulkhead in the dike ponds using nets / waring and bamboo.
c. Creek
   In Brebes, there are several coastal estuaries that affect coastal Brebes. Changing nature of the river that happens, either due to natural processes or due to human activity, both in upstream and downstream, will affect coastal areas in question. Sedimentation and erosion that occurred along the coast of Brebes is also influenced by the mouth of the river.
d. Incurred land
   In coastal areas there are some ground Brebes arise, and the potential to serve two conservation areas are at Sea Island Kaliwlingi Brebes Regency and Karangdempel Island in SubDistrict of Losari. Sand Island is the accretion / sand dune that appears in the waters around 3 kms from the coast region Pandansari, Kaliwlingi village with about 15 meters wide stretches about 5 kms to the Sawojajar Village, Sub District of

Wanasari. Likewise, in Karangdempel Island Sub District of Losari directly adjacent to Cirebon, West Java. Both islands are reachable outboard engine boat about 30 minutes from the beach.

5. Social Economic and Cultural Society Conditions

Number of residents with education up to primary level, and no more than 60% schools. This can be the cause of the level of understanding of the importance of coastal resource management Brebes tends to be less understood by the general public. Based on the type of livelihood, residents in coastal areas Brebes who worked as a farmer / rancher / farmer as much as 29%, 40% of farm workers, fishing 4%, industry-construction laborers 12%, 11% and *PNS / TNI-POLRI* 4%, employers and the remaining 1% others. Percentage phasing prosperous family in Brebes coastal region in 2010 was 21.43% in the category of pre-prosperous, prosperous families 19.49%, 36.80% II family welfare, family welfare 17.78% and 4.72% III family welfare category III plus (Brebes Regency in Figures, 2011).

2.2 Perceptions and Public Participation

2.2.1 Public Perception

Overall perception of the community in the management of mangrove / coastal environmental improvements in the Brebes Regency has a good perception and very good with the highest frequency is a very good perception of as many as 47 people (62.67%). Scoring is based on the perception of the community in the management of mangrove / coastal environmental improvements in the Brebes Regency obtained a value of 92.53% (excellent).

2.2.2 Public Participation

Overall community participation in the management of mangrove / coastal environmental improvements in the Brebes Regency have good participation, quite nice and low, with good participation in environmental improvements in the Brebes regency has the highest frequency by 64 people (85.33%) with a scoring value of 77, 07% (good).

Based on linear regression analysis of the data obtained perception and public participation that relationship perceptions (x) and participation (y) has a correlation coefficient of 0.0852. Determination obtained from the analysis that the closeness of the relationship between perception (x) and participation (y) is very small, only 0.73%, so it can be concluded that the relationship between perceptions of (x) and participation (y) do not influence each other.

2.3 Multiple Regression Analysis

From the results of multiple regression analysis equation Y = 5.042 + 0.446 X1 - 0.008 X2, if the pressure increases, the level of ecological factors damage mangrove / coastal erosion will increase and will be reduced by factors of community participation in conserving the mangrove ecosystem increases. Further means of regression coefficients for ecological factors (X1) = 0.446 which is greater than the absolute value of the regression coefficients for the socio-cultural factors (X2) = -0.008 then the influence of ecological factors of production is more significant than the socio-cultural factors.

2.4 Variety Analysis (ANOVA)

Results count F equal to 31.456 with a significant level of 0000 points, (approaching 100%) in the denominator df 2 and df numerator by 53 indicate ecological factors and socio-

cultural factors are jointly significant effect on the level of damage to the mangrove ecosystem and coastal erosion Brebes Regency.

2.5 t Testt

T coefficient results indicate that the variable ecological factors (X1) has a t value of (7.293) is greater than the table value of t on the real level of (2.000), or it can be said ecological factors (X1) affect the level of damage to mangrove ecosystems / Brebes coastal erosion (Y). T coefficient results showed that socio-cultural variables (X2) has a t value of (-0.057) is smaller than the table value of t on the real level of (2.000), or it can be said variable socio-cultural factors (X2) is not affect the level of damage to mangrove ecosystems / coastal erosion in the Brebes Regency (Y). No significant influence of socio-cultural factors are based on perception and ter-represented in the form of participation in particular planting and maintenance allegedly because mangroves are planted young as a maximum of 2-3 years with a maximum height of approximately 0.5 to 1 meter so that the tree and the root system have not been able to act as a buffer coastal erosion.

2.6 Determinant Test (R^2)

Values obtained from the analysis of adjusted R square (R^2) of 0.525 indicating that the independent variable ecological factors (X1) and socio-cultural factors (X2) were observed jointly contribute to the dependent variable levels of damage mangrove / coastal erosion in Brebes Regency (Y) with a contribution rate of 52.5 % while the remaining 47.5 % is influenced by other variables that can not be observed in this study.

2.7 SWOT Analysis

The total value of internal strategic factors (IFAS) 2,30 and external (EFAS) was 2.15, resulting in a matrix of external internal segment is at position 5, which means that the mangrove area in Brebes Regency is in a relative stable condition and possibilities can be developed again. SWOT strategy ranked each cell as follows:

a. Rank 1: Strategies ST by the number of weighted value of 2.40.
   1. Increase the rigor of implementation of existing regulations to the public and other parties for the realization of the mangrove ecosystem sustainability
   2. Mangrove reforestation improve environmental conditions with respect to the ocean / beach (wave / abrasion and contamination).
   3. Improve outreach to young people / communities about the importance of mangroves for coastal resource conservation within the framework of the handling of environmental degradation / global climate change.

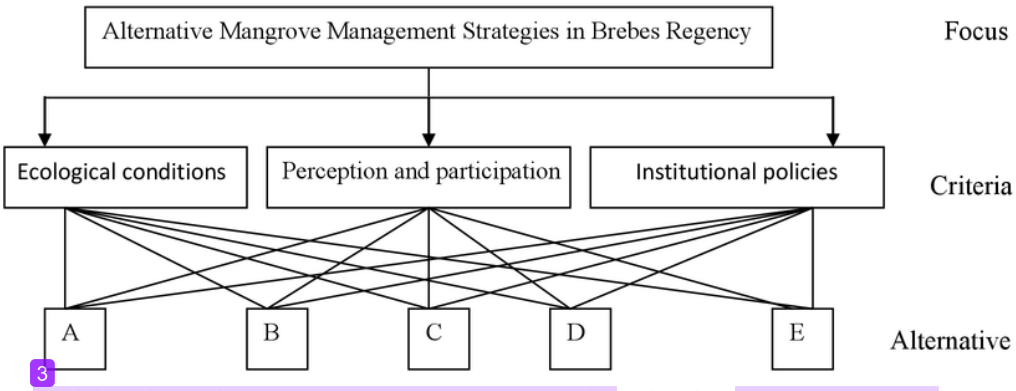
b. Rank 2: SO Strategies with a weighted sum of the values of 2.35
   1. Maintain and develop mangrove areas, streamline implementation and optimize the role of regulatory agencies and social institutions.
   2. Improving the development potential of the mangrove areas thus increasing the value added to the preservation of coastal resources and the welfare of the surrounding community

c. Rank 3: Strategies WT with the amount of weight priceless 2.10.
   1. Strengthening protection of mangrove mangrove trees looting.
   2. Protection of mangrove / shore of sea waves through breakwaters effective.

d. Rank 4: Strategies WO by the number of weighted value of 2.05.
   1. Enhance outreach activities / community empowerment about the importance of mangroves for coastal resource conservation.

2. Strengthen the system of government and private institutions in the mangrove ecosystem management efforts short, medium and long-term.

2.7 Analysis Hierarchy Process (AHP)



Decision alternative mangrove management strategies / abrasion in Brebes Regency

Description:

A. Improve the protection of mangrove areas / beaches from ocean waves / abrasion and develop through retention / breakwater is more effective.

B. Empowering potential of mangrove areas through productive activities that add value to the welfare of society while maintaining sustainability

C. Streamline implementation and optimize the role of regulatory agencies, social agencies, and the participation of local communities in conserving the mangrove areas and coastal resources that exist and develop.

D. Strengthen the system of government and private institutions in the management of mangrove areas for short, medium and long.

E. Strengthen education / empowerment of communities including young people about the importance of mangroves for coastal resource conservation.

The next set of alternative weighting results - any alternative criteria mangrove management strategy that are based on the analysis of perception and participation of local communities as well as a SWOT analysis of the various internal and external factors that are both strengths, weaknesses, opportunities and threats. Then to determine the final result of the weight of each alternative strategy overall calculation of overall priorities with the overall weight or the weight of the entire aggregate of alternative criteria that exist both strategies A, B, C, D and E. Strategy

III. CONCLUSIONS AND RECOMMENDATIONS

3.1 Conclusion

1. Ecological factors and socio-cultural factors were observed in the study jointly affect the level of damage to the mangrove ecosystem and coastal erosion in the Brebes Regency but the influence of ecological factors are more dominant than the socio-cultural factors which do not affect the public perception of the high level of participation. mangroves that have

been successfully planted also still relatively young so root system has not been able to have a significant effect in preventing abrasion.

2. Physically ecological dominance supported by the existing power factor compared with other strategic factors make the conditions in the coastal mangrove ecosystem Brebes relatively still possible to be preserved and developed.

3.2 Recommendation

1. In dealing with the degradation of mangrove ecosystems and coastal erosion in the Brebes Rege ncy to consider prioritization strategy as the results of this study, namely:
   A. Improve the protection of mangrove areas / beaches from ocean waves / abrasion and develop through retention / breakwater is more effective.
   B. Empowering potential of mangrove areas through productive activities that add value to the welfare of society while maintaining sustainability
   C. Streamline implementation and optimize the role of regulatory agencies, social agencies, and the participation of local communities in conserving the mangrove areas and coastal resources that exist and develop.
   D. Strengthen the system of government and private institutions in the management of mangrove areas for short, medium and long.
   E. Strengthen education / empowerment of communities including young people about the importance of mangroves for coastal resource conservation.
2. It required further studies, at least with regard to the following:
   a. Model retainer / effective breakwater to prevent / reduce abrasion so that existing mangrove areas can still be maintained / developed.
   b. Productive model of economic empowerment for the people around the mangrove areas through an integrated fisheries so as to improve people's welfare and where abouts growing needs for business continuity mangrove ecosystem productive earlier.

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